

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 1 007 335 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

27.06.2001 Bulletin 2001/26

(21) Application number: **98919472.5**

(22) Date of filing: **27.04.1998**

(51) Int Cl.7: **B29C 69/02, B65D 41/34**

(86) International application number:
PCT/IT98/00104

(87) International publication number:
WO 98/58792 (30.12.1998 Gazette 1998/52)

(54) **A PROCESS FOR OBTAINING A SINGLE-PIECE CAPSULE MADE OF A PLASTIC MATERIAL**

VERFAHREN ZUM HERSTELLEN EINES EINTEILIGEN KUNSTSTOFFVERSCHLUSSES

PROCEDE D'OBTENTION DE CAPSULES PLASTIQUES D'UNE SEULE PIECE

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

Designated Extension States:
RO SI

(30) Priority: **20.06.1997 IT MO970115**

(43) Date of publication of application:
14.06.2000 Bulletin 2000/24

(73) Proprietor: **Bormioli Rocco & Figlio S.p.A.
43100 Parma (PR) (IT)**

(72) Inventor: **MORINI, Emilio
I-43052 Colorno (IT)**

(74) Representative: **Gotra, Stefano
BUGNION S.p.A.
No. 25, Via Emilia Est
41100 Modena (IT)**

(56) References cited:

EP-A- 0 073 334	EP-A- 0 117 104
EP-A- 0 410 059	EP-A- 0 521 389
US-A- 4 458 822	US-A- 4 666 053
US-A- 5 295 600	

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 007 335 B1

Description

Technical Field

[0001] The invention relates to a process for obtaining a single-piece capsule made of a plastic material.

Background Art

[0002] Capsules of the type described above have been in use for some time, as caps for bottles containing water, drinks and liquids in general. These capsules, briefly, comprise a cap for opening and closing the bottle, and a device, generally a security strip, for ascertaining whether a bottle has been opened.

[0003] The relatively low cost of each of these capsules and the very high number of capsules used lends importance to even a small improvement in their manufacture; indeed, even with a tiny improvement an enormous production saving can be made.

[0004] European Patent Specification EP-A-0 410 059 discloses a process for obtaining moulded single-piece capsules made of plastic material, which are screwable on to a container and are provided with a skirt connected to a free perimeter of a lower zone of the capsule. The skirt is folded internal wise of the capsule by plastic deformation of a connection zone between the skirt and the lower zone of the capsule.

[0005] An established manufacturing method for these capsules is press-forming, which consists in introducing a piece of plastic material into the matrix of a die and deforming the material by means of a punch which penetrates the matrix and forces the material to occupy all of the space between the punch and the matrix, which space is obviously in the shape of the finished capsule.

[0006] Single-piece plastic capsules are made in this way, which, in the simplest and most economical versions, can be ready for use as soon as they are formed, while more refined and reliable versions require subsequent work operations.

[0007] This technology has the advantage that the dies are quite simple and can be used, for example, in rotary machines which comprise a large number of die matrices and punches; these machines are extremely fast and can provide a very high rate of production.

[0008] The disadvantage of this technology is that, for manufacturing more refined and more reliable capsules, subsequent work operations are required, which lengthen production times at the expense of production rate, i.e. productivity.

[0009] The main aim of the present invention is to suggest a process for manufacturing plastic capsules which reduces production times, and therefore costs, but which at the same time produces highly reliable capsules.

[0010] This aim is achieved by the process of the invention, as it is characterised in the appended claims.

[0011] Further characteristics and advantages of the

present invention will better emerge from the detailed description that follows of the various phases of the process, illustrated purely by way of non-limiting example in the accompanying figures of the drawings, in which:

figure 1 is a schematic partial vertical-elevation section of a capsule as it appears after the pressing phase;

figure 2 is a schematic partial vertical-elevation section of a capsule as it appears after the folding phase;

figure 3 is a schematic partial vertical-elevation section of a cut capsule, with a schematic illustration of a cutting blade and some cuts;

figure 4 is a partial schematic view from above of a capsule, with a schematic illustration of a cutting blade.

Disclosure of Invention

[0012] The process of the invention comprises a pressing phase, in which a plastic material is compressed to obtain a single-piece capsule 1 which is usually screwable on a container, or which might be provided with an internal thread directly during the pressing phase. The capsule 1 is also provided with a skirt 2 connected to the free perimeter 1b of the lower zone 1a of the capsule. The skirt is made directly during the pressing phase. To enable easy extraction of the punch from the die, the skirt is made with a slightly inclined configuration, inclined towards the inside of the capsule, with respect to the lateral wall of the capsule itself. This configuration is illustrated by way of example in figure 1.

[0013] The capsule thus obtained has a fairly uniform breadth and does not exhibit easy-break zones which, generally, are what lead to setting problems in the dies, constructional complications in the dies themselves, and a high percentage of rejects during production.

[0014] The skirt is then subjected to a folding phase internalwise of the capsule; this folding phase is preferably obtained by means of inserting, from below and in an axial direction, a calibrated pad (not illustrated) into the capsule. During this phase a plastic deformation is created in the connection zone 3 between the skirt 2 and the lower zone 1a of the capsule, making the deformation permanent, i.e. the folding of the skirt inwards.

[0015] On completion of this phase the capsule exhibits the configuration of figure 2. The skirt folded up in this way will perform the function of connecting up with the neck of a container, for example a water bottle - the necks usually having a lip projection under which the skirt will house.

[0016] Considerable complications in the die construction can be avoided using this working process. Apart from higher costs, more complicated prior-art dies offer a lower production rate and thus a lower productivity.

[0017] A cut is made of the lower zone 1a of the capsule, by radially inserting horizontal blades 4a and vertical blades 4b, both provided with shaped cutting edges; during this phase, cuts 5a and 5b are made in the lower zone, which cuts are of a predetermined shape and size and are generally discontinuous. These cuts constitute the easy-break ruptures, destined to break when the capsule is first opened. After the cutting phase, the parts which have been cut stay connected to the capsule thanks to the discontinuity 8 of the cuts.

[0018] Obtaining the discontinuous cuts is an easy process, which consists in shaping the blades by making recesses corresponding to the discontinuity 8 of the cuts. In particular, the vertical blades 4b are provided with shaped cutting edges in such a way as to obtain vertical cuts 5b both in the lateral wall of the capsule and in the folded skirt.

[0019] Constructively, the operative characteristics indicated for the cutting phase might be obtained, for example, by using a continuous rotary machine having a work station equipped with jaws, not illustrated, for supporting the blades, and which grip each capsule as it arrives while moving in a radial direction with respect to the capsule.

[0020] The horizontal cuts 5a might advantageously be alternated with the non-cut zones 6 so that when the capsule is first opened the lower zone of the capsule, which constitutes the security strip, will break at the discontinuities 8 but will stay connected to the remaining part of the capsule in the parts where it is not cut. This is particularly interesting in relation to the problem of recycling of containers.

[0021] As the skirt folding and the cutting phases are effected in such a way that the tools that do the folding and cutting do not interfere with each other, the two operations could be done contemporaneously, for example on a single station of a continuous rotary machine, with an obvious increase in process speed. This operating mode is also particularly advantageous in that clean and certainly through-cuts can be made without running the risk of damaging the blades carrying out the cutting operation. The blade, which in order to make clean through-cuts has to cut the external surface of the capsule all the way through, penetrating internally of the capsule, when it has cut through meets either the skirt 2 (i.e. a soft material) where the skirt is higher than the cut made, or an empty zone in cuts where the skirt is lower than the cut. In both cases the blade never comes into contact with hard materials such as that used for the pad for folding the skirt or any internal striker surface preventing flexion of the wall of the capsule at the moment of cutting.

[0022] These phases can just as easily be carried out in succession, for example using two successive stations of a continuous rotary machine.

[0023] The process of the invention does not have the aim of proposing a new type of capsule, but provides a new manufacturing process for capsules, either of

known type or new, whose characteristic element is that it uses a succession of working phases, some of which are known in isolation, which enables a series of advantages to be attained: an increase in capsule machine productivity, with a consequent reduction in production costs; a very high working precision, leading to fewer reject pieces; greater facility in inserting the capsule on the container and greater ease of use for the consumer opening the container; elimination of parts the capsule which, on opening, in the known processes remain attached to the container neck, while in the present process remain attached to the container, with a consequent reduction of problems connected with container recycling.

Claims

1. A process for obtaining single-piece capsules made of a plastic material, comprising the following phases:

press-forming of a plastic material to obtain a single-piece capsule (1), of a type which is screwable on to a container, and which is provided with a skirt (2) connected to a free perimeter (1b) of a lower zone (1a) of the capsule; a folding of the skirt (2) internalwise of the capsule, which folding is achieved by plastic deformation of a connection zone (3) between the skirt (2) and the lower zone of the capsule; a cutting of the lower zone of the capsule, by means of a radially-directed insertion of blades (4a, 4b) in order to obtain, in said lower zone, a number of cuts (5a, 5b) of predetermined shape and size.

2. The process of claim 1, wherein said folding phase of the skirt (2) is obtained by means of inserting a calibrated pad into the capsule from below and travelling in an axial direction.
3. The process of claim 2, wherein said skirt folding phase and said cutting phase are carried out contemporaneously.
4. The process of claim 1, wherein said cutting phase is performed using horizontal blades (4a) and vertical blades (4b), which are provided with shaped cutting edges for obtaining discontinuous cuts (5a, 5b).
5. The process of claim 4, wherein said vertical blades (4b) are provided with shaped cutting edges so that said cutting phase of said lower zone of the capsule involves both a side wall of the capsule and the folded skirt.

6. The process of claim 4, wherein the horizontal blades (4a) are provided with shaped cutting edges so that the cutting phase provides horizontal cuts (5a) which are alternated with uncut zones (6).

5

Patentansprüche

1. Verfahren zum Herstellen eines einteiligen Kunststoffverschlusses, enthaltend folgende Phasen:

10

- Pressformen eines Kunststoffmaterials, um einen einteiligen Verschluss (1) von einem Typ zu erhalten, der auf einen Behälter aufschraubbar ist, und welcher mit einem Rand (2) versehen ist, verbunden mit einer freien umlaufenden Kante (1b) eines unteren Bereiches (1a) des Verschlusses;

15

- Umbiegen des Randes (2) nach innen des Verschlusses (1), welches Umbiegen durch die plastische Verformung eines Verbindungsgebietes (3) zwischen dem Rand (2) und dem unteren Bereich des Verschlusses erhalten wird;

20

- Schneiden des unteren Bereiches des Verschlusses mit Hilfe des Einführens von radial ausgerichteten Messern (4a, 4b), so dass in dem genannten unteren Bereich eine Anzahl von Einschnitten (5a, 5b) von bestimmter Form und Grösse erhalten wird.

25

30

2. Verfahren nach Patentanspruch 1, bei welchem die genannte Umbiegungsphase des Randes (2) durch das Einschieben eines kalibrierten Dorns in den Verschluss von unten her und in axialer Richtung gleitend erhalten wird.

35

3. Verfahren nach Patentanspruch 2, bei welchem die genannte Umbiegungsphase und die genannte Schneidphase gleichzeitig ausgeführt werden.

40

4. Verfahren nach Patentanspruch 1, bei welchem die genannte Schneidphase ausgeführt wird, indem horizontale Messer (4a) und vertikale Messer (4b) verwendet werden, welche mit geformten Schneidkanten versehen sind, um unterbrochene Einschnitte (5a, 5b) zu erhalten.

45

5. Verfahren nach Patentanspruch 4, bei welchem die genannten vertikalen Messer (4b), bei welchem die vertikalen Messer (4b) mit geformten Schneidkanten versehen sind, so dass die Schneidphase an dem genannten unteren Bereich des Verschlusses sei es die Seitenwand des Verschlusses wie auch den umgebogenen Rand mit einbezieht.

50

55

6. Verfahren nach Patentanspruch 4, bei welchem die horizontalen Messer (4a) mit geformten Schneid-

kanten versehen sind, so dass die Schneidphase horizontale Einschnitte (5a) vorsieht, welche sich mit nicht geschnittenen Bereichen (6) abwechseln.

Revendications

1. Un procédé d'obtention de capsules plastiques d'une seule pièce, comprenant les phases suivantes:

- un préformage d'une matière plastique pour obtenir une capsule en une seule pièce (1), du type pouvant se visser sur un conteneur, pourvue d'une jupe (2) reliée à un périmètre libre (1b) d'une zone inférieure (1a) de la capsule;
- un pliage de la jupe (2) vers l'intérieur de la capsule, lequel pliage est réalisé par l'intermédiaire de la déformation plastique d'une zone de connexion (3) entre la jupe (2) et la zone inférieure de la capsule;
- une coupe de la zone inférieure de la capsule, au moyen de l'insertion radiale de lames (4a, 4b), de manière à obtenir, dans ladite zone inférieure, un certain nombre de coupes (5a, 5b) de forme et dimensions prédéterminées.

2. Le procédé selon la revendication 1, dans lequel ladite phase de pliage de la jupe (2) est obtenue au moyen de l'insertion d'un calibre dans la capsule depuis le bas et se déplaçant dans une direction axiale.

3. Le procédé selon la revendication 2, dans lequel ladite phase de pliage de la jupe et ladite coupe sont réalisées dans le même temps.

4. Le procédé selon la revendication 1, dans lequel ladite phase de coupe est réalisée en utilisant des lames horizontales (4a) et des lames verticales (4b), pourvues de bords de coupe conformés de manière à obtenir des coupes discontinues (5a, 5b).

5. Le procédé selon la revendication 4, dans lequel lesdites lames verticales (4b) sont pourvues de bords de coupe conformés de manière à ce que ladite phase de coupe de ladite zone inférieure de la capsule concerne aussi bien la paroi latérale de la capsule que la jupe pliée.

6. Le procédé selon la revendication 4, dans lequel les lames horizontales (4a) sont pourvues de bords de coupe conformés de manière à ce que ladite phase de coupe produise des coupes horizontales (5a) alternées avec des zones non coupées (6).

Fig.1

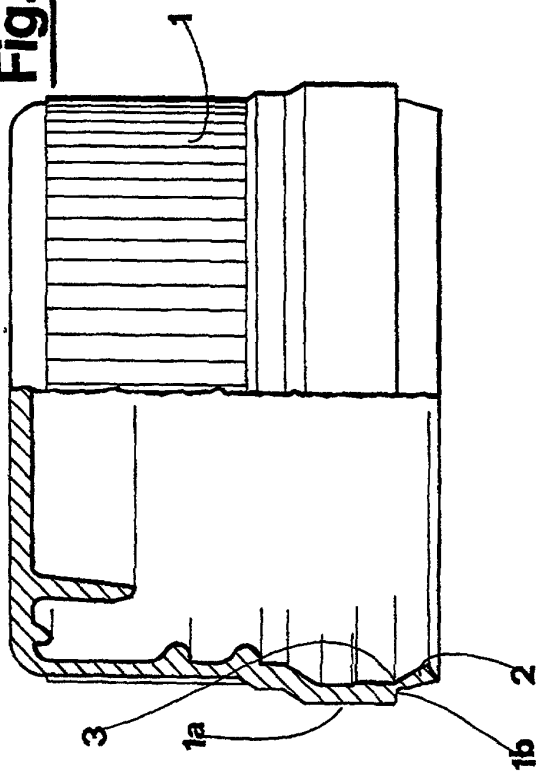


Fig.2

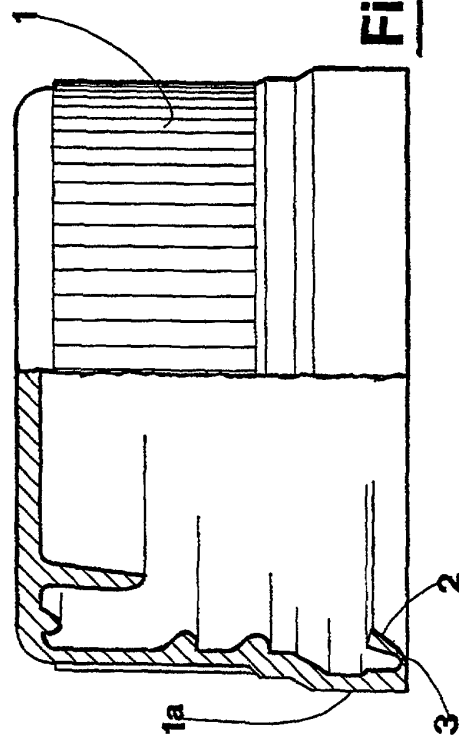


Fig.3

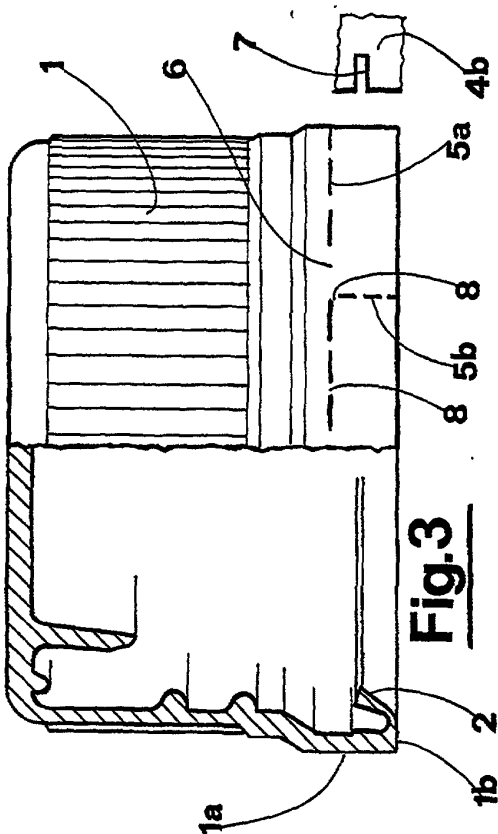


Fig.4

